920522-95773

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE THE APPLICATION OF	
Bart De Cock, et al.	Examiner: Minh Nhut Tang
SERIAL NO.: 10/805,972	Confirmation No. 1363
FILED: March 22, 2004	Group Art Unit: 2829
FOR: Device and Method for Detecting Rotor Speed of a Multiple Phase Motor with Bipolar Drive	Customer Number: 23644

BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal is from the Examiner's final Office Action of September 19, 2006. An appropriate Notice of Appeal, with the necessary Petition for Extension of Time, was timely filed with the Patent and Trademark Office on January 19, 2007, making this Appeal Brief due on March 19, 2007.

The appeal fee of $500 pursuant to 37 C.F.R. §41.20(b)(2) should be deducted from Deposit Account No. 12-0913.

(i) Real Party in Interest

The real party in interest for this application is the Assignee, AMISemiconductor Belgium BVBA.

(ii) Related Appeals and Interferences

There are no known related appeals or interferences which may be related to, directly affect or be directly affected by or have a bearing on the decision in this Appeal.

(iii) Status of Claims

This application was filed with twenty claims, and during prosecution claims 4 and 16 were cancelled. The remaining claims, claims 1-3, 5-15 and 17-20 are rejected. It is the rejection of claims 1-3, 5-15 and 16-20 that is appealed, and the appealed claims are set forth in the Claims Appendix.

(iv) Status of Amendments

No claim amendments were made following the final Office Action. However, a response, arguing the impropriety of the final Office Action, was filed with the Patent and Trademark Office on December 15, 2006, leading to an Advisory Action of January 9, 2007 in which the examiner simply stood fast based upon the rejections set forth in the final Office Action.

(v) Summary of Claimed Subject Matter

There are two independent claims in the application, claims 1 and 12.

A. Claim 1 – Independent

The subject matter of claim 1 is directed to a method for detecting rotation of a rotor of a multiphase motor with bipolar drive in which the motor comprises at least two stator windings which can be energized (page 4, lines 26 -29 and page 7, lines

19-30; figure 1). According to the method, the induced voltage (back EMF) generated in the first and second stator winding, when they are not energized respectively, is sensed sequentially and alternately (page 9, lines 1-8 and from page 11, line 29 to page 12, line 11 and figures 2 and 3). The sensing of the induced voltage is done at or near the end of the period of a non-energized state (page 10, lines 11–14). The value of the amplitude of the sensed voltage is stored in a memory device (page 12, lines 22–30 and figure 4).

B. Claim 12 – Independent

Independent method claim 1 is similar to independent apparatus claim 12. As a result, the summary of the claimed subject matter of independent claim 12 is the same as claim 1 above, and reference is made to the immediately-preceding paragraph for the description of claim 12, as well.

(vi) Grounds of Rejection to be reviewed on Appeal

There are two grounds of rejection of the claims of this application:

A. Ground of rejection 1 (Claims 1-3, 5-15 and 17-20)

Claims 1-3, 5-15 and 17-20 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

B. Ground of rejection 2 (Claims 1-3, 5-15 and 17-20)

Claims 1-3, 5-15 and 17-20, "as best understood", are rejected under 35 U.S.C. §102(b) as being anticipated by Fincher (U.S. 4,851,755).

(vii) Argument

A. Ground of rejection 1 (Claims 1-3, 5-15 and 17-20)

The Examiner has rejected claims 1-3, 5-15 and 17-20 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.
This rejection is respectfully traversed.

In a telephone interview January 16, 2007, the Examiner admitted that the response to the Office Action of September 19, 2006 was satisfactory insofar as 35 U.S.C. §112 is concerned. For this reason, this rejection ground should no longer need to be addressed. However, the Examiner never issued an interview summary, and just to be certain, the remarks of the December 15, 2006 response are repeated immediate below:

1. The Rejection of the Claims under U.S.C. §112, first paragraph.

The Office Action rejected claims 1-3, 5-15 and 17-20 under 35 U.S.C. 112 as failing to comply with the written description requirement. In particular, according to the Office Action, the limitation in claims 1 and 12 "storing the sensed voltage **amplitude** values" is not supported by the original specification so that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. Still according to the Office Action, in the original specification, only the limitation "storing sensed voltage values" can be found so that the limitation "voltage amplitude values" would be missing.

Applicant respectfully disagrees and reconsideration is requested.

According to US courts, an applicant shows possession of the claimed invention by describing the claimed invention with all of its limitations using such descriptive means as words, structures, figures, diagrams, and formulas that fully set forth the claimed invention. *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997).

The following explanation is offered to show that the limitation "storing sensed voltage amplitude values" was already adequately described in the original specification:

a. The meaning of the word "voltage". Webster's Encyclopedic Unabridged Dictionary of the English Language (edition 1996) gives as definition of the word "voltage": *electromotive force or potential difference expressed in volts.* Thus, each

time in the specification the words "voltage values" or "BEMF value" are used, only a value which can be expressed in volts can be meant. Electrical signals can have different characteristics, e.g. amplitude, frequency, phase and time delay. Of all these characteristics, only the amplitude (corresponding to a potential difference) is expressed in volts and by consequence, the only interpretation which can be given to the words "voltage values" or "BEMF value" is the value of voltage amplitude. This, it is submitted, is well known to one skilled in the art.

b. In the original specification itself, the word "amplitude" is also used, and not only in relation with the state of the art (page 2, lines 1, 11 and 18) but also in relation with the invention itself. On page 10, lines 24-27 mentions the influence of certain parameters on the amplitude and shape of the BEMF signals and on page 14, lines 4-12, how this influence "on the <u>amplitude</u> of the signals" can be removed. In the same paragraph, reference is taken to Fig.4 and the "filtered measured back EMF signal Vint". From this paragraph, it is thus clear that, in the description as filed, by "voltage values" or "the measured back EMF signal" is meant the amplitude of the voltage values or the BEMF signals.

c. From the drawings and the accompanying part of the specification it is also clear that by voltage values the amplitudes of the voltage values is meant. Fig. 4 shows a circuit of analog processing of back EMF signals, obtained according to the present invention. According to that circuit, the BEMF signals are sampled (switch 12) and stored in a capacitor (Cs). A capacitor can only store the amplitude of the signal at its entry. The sampled and stored signal is then integrated by an integrating capacitor (Ci). Here again, only the amplitude of a signal can be integrated. The integrated signal is then compared in a comparator element (14), which is clearly a differential amplifier (see the – and + signs within the symbol of 14). It is well-known to a person, skilled in the relevant art, that a differential amplifier compares the <u>amplitudes</u> of the signals at its input. Also according to Fig. 4, only amplitudes of the BEMF signals are measured (sensed), stored and further processed. On top of that, Fig. 4 is a one-to-one translation of the wording of claims 1 and 12.

d. Fig. 7 and 8 give, in function of time, the relevant back EMF waveforms. Fig. 7(a) and (b) show the waveforms of the signals induced in the first winding (3). Fig. 8(a) shows the voltage Vs, corresponding to the charge on the sampling capacitor and Fig. 8(b) shows the voltage on the integrating capacitor. In these diagrams, the Y-

axis corresponds always to a V, which is a voltage, and indicates the amplitude of the different voltages.

Each of the arguments a to d show clearly that in the specification and drawings as filed, by voltage value is meant the amplitude value of a voltage, which is also the common understanding of these words.

The claimed invention with its limitations was thus described in the original specification and the applicant had possession of the claimed invention as of the filing date. By consequence, claims 1 and 12 comply with the written description requirement, and the rejection should be retracted.

All other claims were rejected since they are depending on rejected base claims. Claims 1 and 12 complying with the written description requirement, the same can be said in relation with the depending claims.

B. Ground of rejection 2 (Claims 1-3, 5-15 and 17-20)

The Examiner has rejected claims 1-3, 5-15 and 17-20, as best understood (although it is submitted this is no longer at issue), under 35 U.S.C. 102(b) as being anticipated by Fincher (U.S.P. 4,851,755). This rejection is respectfully traversed.

Independent claim 1 of the present invention, which is also representative of independent claim 12, reads as follows:

> 1. A method for detecting rotation of a rotor of a multiple phase motor with bipolar drive, the motor comprising at least a first and a second energizable motor stator winding, the method comprising sequentially and alternately sensing a voltage on the first and the second motor stator winding at or near the end of a period of a non-energized state thereof,
> wherein the method furthermore comprises storing the sensed voltage amplitude values of the first and second motor stator windings in a memory device.

With regard to claim 1, the Examiner states:

> As to claims 1, 7 and 12, Fincher discloses, in Fig. 3, an apparatus and method for detecting rotation of a rotor (12) of a multiphase motor (10) with bipolar drive, the motor (10) comprising at least a first and a second energizable motor stator winding (14a, 14b), the apparatus comprising means

> (32) for sequentially and alternately sensing a back electromagnetic force (voltage pulse induced in a deenergized stator winding due to back EMF) on the first and the second motor stator winding (14a, 14b) at or near the end of a period of a non-energized (i.e. deenergized stator winding) state thereof, wherein the apparatus furthermore comprises means (56) for storing the sensed voltage values (a predetermined number of consecutive pulses) of the first and second motor stator windings (14a, 14b).

(see Final Office Action, dated September 19, 2006, page 3, point 4).

With respect to the feature concerning the storing of the sensed voltage values, the Examiner states further:

> Applicants, in the Remarks pages 8 and 9, filed on March 16, 2006, asserted that Fincher does not disclose storing voltage values in a memory device because a sensed voltage value (also information about amplitude!) is different from a single bit (1 or 0); Finch does not hint in the direction of storing full voltages in a memory device and does not disclose any further processing of the Vbmf signal. The Examiner respectfully disagrees because, as disclosed in column 2, lines 6-30 and column 7, lines 3-12 of the Fincher reference, during each step a back electromagnetic force (EMF) in the form of a voltage pulse is induced by the motion of the rotor into the deenergized phase of the stator, the pulse detection/discrimination circuit detects the amplitude and polarity of the induced pulse, and determines whether the obtained pulse indicates actual motor movement, the circuit 54 compares the information obtained on lines 61-64 with the information on line 66, and it provides an output pulse on line 65 of one logic level, for example a high level pulse, when comparison is obtained, and of a second logic level, for example a low level pulse when comparison is not obtained, the history register 56 receives and stores a predetermined number of consecutive pulses applied thereto via line 65; therefore it is believed that the Fincher reference discloses storing sensed voltage values (i.e., number of consecutive pulses, for example number of consecutive high level pulses) in a memory device (history register 56).

(see Office Action dated April 28, 2006, page 4, point 3).

Applicants respectfully disagree with the conclusion of the Examiner that the Fincher reference discloses storing sensed voltage values in a memory device. As indicated in the last mentioned Office Action, Fincher teaches that the induced pulse, after being processed in the differential band pass filters 50 and the amplitude and polarity detectors 52, is fed, over the lines 61-64, to a pulse discriminator and selection logic circuit 54, which receives also, over lines 66 (four lines, each of them corresponding with one of the energizing phases of the motor), information indicating which phase

of the motor is presently being energized/deenergized (col. 6, lines 66-68). The pulse discriminator and selection logic circuit 54 detects whether there exists a coincidence (figure 4B, AND circuits 125 to 128) between a sensed induced pulse (inputted over lines 61 to 64 to the AND circuits) and the corresponding energized motor phase (inputted over lines 66a to 66d to the AND circuits; see also col. 9, lines 41-64). The output of the pulse discriminator and selection logic circuit 54 can be a high level pulse (corresponding to a turning state of the rotor) or a low level pulse (corresponding to a stalling state of the rotor). This output is thus representative of the coincidence between two signals: an induced pulse and a signal representing the energized/deenergized motor phase. The output is clearly not representative of the voltage value (or the voltage amplitude value) of the sensed induced pulse.

The output of the pulse discriminator and selection logic circuit 54 (the high level and the low level pulses) is fed to a history register 56 where a number of these output pulses are stored (eight in the example given in the text). The information, present in the history register, thus represents the number of times there has been a coincidence/non-coincidence between a sensed induced pulse and an energizing phase of the motor.

In no manner does the history register 56 give information about the voltage value (or the voltage amplitude value) of the sensed induced pulse. Quite unlike Fincher, this kind of information is present in the memory device of the present invention (sample capacitor Cs – see page 12, lines 27-30 of the specification) and is claimed in the feature at the end of claim 1 in the concluding paragraph.

According to the present invention, this stored voltage value is further compared with the back EMF values, measured during previous cycles in order to obtain a signal representing the variation in back EMF (see specification page 13, lines 9-14), permitting, in certain circumstances, an immediate reaction of the system (debounce time delay equal to zero; see specification from page 13, line 33 to page 14, line 3).

The possibility of an immediate reaction constitutes an advantage of the invention in comparison with systems like the one disclosed in Fincher, where a certain number of pulses are needed before giving a command for changing the drive power.

It thus must be concluded that the feature in claim 1: "storing the sensed voltage amplitude values of the first and second motor stator windings in a memory device' is not disclosed in Fincher and claim 1 is thus not anticipated by Fincher.

Claim 1 meets also the requirement of non-obviousness. There is no indication or suggestion in Fincher hinting in the direction of the feature relating to the storing of sensed amplitude values, nor is there any teaching or suggestion of this feature in the other cited prior art references (US 4,422,040 – Raider et al.-; US 5,376,866 – Erdman-; US 6,586,898 – King et al.). Claim 1 is thus also non-obvious in view of the prior art as there is no teaching, suggestion or motivation to introduce storing of sensed amplitude values.

In view of the arguments above and claim 1 being also representative of apparatus claim 12, independent claims 1 and 12 are in condition for allowance. Claims 2-3, 5-11, 13 -15 and 17-20 are dependent claims, depending on independent claims 1 and 12, respectively. Consequently, claims 2-3, 5-11, 13 -15 and 17-20 also are allowable, at least by virtue of their dependence on allowable claims.

CONCLUSION

The above has demonstrated that the rejection of claim 1-3, 5-15 and 17-20 is in error and that the Examiner should be reversed. Such action is therefore solicited.

March 19, 2007

Respectfully submitted,

William M. Lee, Jr.
Registration No. 26,935
Barnes & Thornburg
P.O. Box 2786
Chicago, Illinois 60690-2786
(312) 214-4800
(312) 759-5646 (fax)

Claims Appendix

1.- A method for detecting rotation of a rotor of a multiple phase motor with bipolar drive, the motor comprising at least a first and a second energizable motor stator winding, the method comprising sequentially and alternately sensing a voltage on the first and the second motor stator winding at or near the end of a period of a non-energized state thereof,
wherein the method furthermore comprises storing the sensed voltage amplitude values of the first and second motor stator windings in a memory device.

2.- A method according to claim 1, wherein the sensing of the voltage on the first motor stator winding is carried out during energizing of the second motor stator winding, and wherein the sensing of the voltage on the second motor stator winding is carried out during energizing of the first motor stator winding.

3.- A method according to claim 1, wherein the sensing has a fixed or adjustable relative position in a non-energized state time-window.

4.- (cancelled)

5.- A method according to claim 1, furthermore comprising sensing multiple voltage samples, and storing the multiple samples in the memory device.

6.- A method according to claim 1, wherein the motor is driven in microstepping operation.

7.- A method according to claim 1, wherein the voltage is a back EMF.

8.- A method according to claim 1, furthermore comprising outputting a detection signal indicative of a stalled condition of the motor.

9.- A method according to claim 1, furthermore comprising outputting a detection signal indicative of a rotation of the motor rotor or derivatives thereof versus time.

10.- A method according to claim 1, where for sensing the voltage a unipolar signal is measured across one non-energized motor stator winding by connecting one terminal of the motor stator winding to a fixed or reference potential while measuring the voltage at an other terminal of that non-energized motor stator winding.

11.- A method according to claim 1 excluding a three-phase motor with bipolar drive with star connected coils.

12.- An apparatus for detecting rotation of a rotor of a multiple phase motor with bipolar drive, the motor comprising at least a first and a second energizable motor stator winding, the apparatus comprising means for sequentially and alternately sensing a back electromagnetic force on the first and the second motor stator winding at or near the end of a period of a non-energized state thereof,

wherein the apparatus furthermore comprises means for storing the sensed voltage amplitude values of the first and second motor stator windings.

13.- An apparatus according to claim 12, excluding a three-phase motor with bipolar drive with star connected coils.

14.- An apparatus according to claim 12, wherein the means for sequentially and alternately sensing has means for sensing of a voltage on the first motor stator winding during energizing of the second motor stator winding and means for sensing of a voltage on the second motor stator winding during energizing of the first motor stator winding.

15.- An apparatus according to claim 12, wherein the means for sequentially and alternately sensing has a fixed or adjustable relative position in a non-energized state time-window.

16.- (cancelled).

17.- An apparatus according to claim 12, wherein the means for sensing has means for sensing multiple voltage samples, further comprising means for storing the multiple samples.

18.- An apparatus according to claim 12, furthermore comprising means for outputting a detection signal indicative of a stalled condition of the motor.

19.- An apparatus according to claim 12, furthermore comprising means for outputting a detection signal indicative of a rotation of the motor rotor or derivatives thereof versus time.

20.- An apparatus according to claim 12, further comprising means for sensing a unipolar signal across one non-energized motor stator winding by connecting one terminal of the motor stator winding to a fixed or reference potential while measuring the voltage at an other terminal of that non-energized motor stator winding.

Evidence Appendix

This is no such appendix.

Related Proceedings Appendix

This is no such appendix.

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